WHAT IS CLAIMED IS:

1. An interferometer for measuring a surface shape of an optical element using interference, said interferometer comprising a reference wave-front generating unit for generating a reference wave front for measuring the surface shape, which is provided in a target optical path, and includes an Alvarez lens.

2. An interferometer according to claim 1, wherein said Alvarez lens generates a sixth-order or higher component of a moving radius of the reference wave front.

3. An interferometer according to claim 1, wherein there are plural Alvarez lenses, the number of Alvarez lenses corresponding to the number of orders of a moving radius in the reference wave front to be generated.

4. An interferometer according to claim 1, wherein said Alvarez lens generates a fourth-order or higher component of a moving radius of the reference wave front.

5. An interferometer according to claim 1, wherein said reference wave-front generating unit

variably generates a fourth-order or higher component of a moving radius of the reference wave front.

6. An interferometer for measuring a surface shape of an optical element using an interference, said interferometer comprising a reference wave-front generating unit, provided in a target optical path, for generating a reference wave front as a measurement reference for the surface shape, said unit variably generating a fourth-order or higher component of a moving radius of the reference wave front.

7. An interferometer according to claim 6, wherein said reference wave-front generating unit includes a plurality of optical members, a reference position of each optical member being determined at such a position that aberration generated in said reference wave-front generating unit may be minimized.

8. An interferometer according to claim 6, wherein said reference wave-front generating unit has a spherical aberration generating part.

9. An interferometer according to claim 8, wherein said spherical aberration generating mechanism has a plurality of lens members, and adjusts generation

of aberration by adjusting a separation between two of the lens members.

10. An interferometer according to claim 8, wherein said spherical aberration generating mechanism has a plurality of lens members for serving as a parallel plane, said optical member being able to adjust a parallel plane.

11. An interferometer according to claim 6, wherein said reference wave-front generating unit includes an Alvarez lens.

12. An interferometer according to claim 6, wherein said reference wave-front generating unit includes:

a mobile part that may variably generate the reference wave front; and

a monitor part for monitoring positional information of said mobile part.

13. An interferometer according to claim 12, wherein said interferometer uses a moving amount of the mobile part obtained from the monitor part to calculate the wave front to be generated and uses the calculated wave front for the reference wave front.

14. An interference measurement method for measuring a surface shape of an optical element using interference, said method comprising the steps of:

generating a reference wave front as a measurement reference for the surface shape by using a reference wave-front generating unit including an Alvarez lens;

introducing the reference wave front to a surface of the optical element; and

measuring the surface shape by interfering the reference wave front with a target wave front through the surface of the optical element.

15. A method according to claim 14, wherein said reference wave-front generating unit variably generates a fourth-order or higher component of a moving radius of the reference wave front.

16. An interference measurement method for measuring a surface shape of an optical element using interference, said method comprising the steps of:

generating a reference wave front as a measurement reference for the surface shape by using a reference wave-front generating unit for variably generating a fourth-order or higher component of a moving radius of the reference wave front;

introducing the reference wave front to a surface of the optical element; and

measuring the surface shape by interfering the reference wave front with a target wave front through the surface of the optical element.

17. A method according to claim 16, wherein said reference wave-front generating unit includes a plurality of optical members, a reference position of each optical member being determined at such a position that aberration generated in said reference wave-front generating unit may be minimized.

18. A method according to claim 16, wherein said reference wave-front generating unit includes a mobile part that may variably generate the reference wave front, and

wherein said generating step calculating a shape of the reference wave front based on a moving amount obtained by monitoring positional information of the mobile part.

19. An exposure apparatus using an optical element manufactured by using an interferometer for measuring a surface shape of an optical element using interference, the interferometer comprising a reference wave-front generating unit for generating a reference

wave front for measuring the surface shape, which is provided in a target optical path, and includes an Alvarez lens.

20. An exposure apparatus using an optical element manufactured by using an interferometer for measuring a surface shape of an optical element using an interference, the interferometer comprising a reference wave-front generating unit, provided in a subject optical path, for generating a reference wave front as a measurement reference for the surface shape, said unit variably generating a fourth-order or higher component of a moving radius of the reference wave front.

21. An exposure apparatus using an optical element manufactured by using an interference measurement method for measuring a surface shape of an optical element using interference, the method comprising the steps of generating a reference wave front as a measurement reference for the surface shape by using a reference wave-front generating unit including an Alvarez lens, introducing the reference wave front to a surface of the optical element, and measuring the surface shape by interfering the reference wave front with a target wave front through the surface of the optical element.

22. An exposure apparatus using an optical element manufactured by using an interference measurement method for measuring a surface shape of an optical element using interference, the method comprising the steps of generating a reference wave front as a measurement reference for the surface shape by using a reference wave-front generating unit for variably generating a fourth-order or higher component of a moving radius of the reference wave front, introducing the reference wave front to a surface of the optical element, and measuring the surface shape by interfering the reference wave front with a target wave front through the surface of the optical element.

23. An interferometer for measuring surface information of a target surface by interfering a reference wave front from a reference mirror with a target wave front from the target surface, said interferometer comprising a reference wave-front generating unit, provided in an optical path for the target surface, for generating a reference wave front as a measurement reference for the surface information of the target surface, wherein said reference wave-front generating unit comprising:

a spherical aberration generating part for variably generating a spherical aberration; and

an Alvarez lens part for variably generating a component of six or higher power of a moving radius of the reference wave front.

24. An interference measurement method for measuring a surface shape of an optical element using interference, said method comprising the steps of:

dividing a measurement surface of the optical element into at least two segments; and

interference-measuring each segment,

wherein in measuring a surface shape, a wave front as a measurement reference for a measurement of at least one segment is an aspheric wave front.

25. A method according to claim 24, further comprising a step of an aspheric wave-front generating part approximately independently controllably forming each of fourth-order or higher components of a moving radius of the wave front in the aspheric wave front.

26. A method according to claim 25, further comprising the steps of:

approximately independently controlling, in the aspheric wave front, each of fourth-order or higher components of a moving radius of the wave front; and

controlling curvature of a spherical component for each segment to be measured.

27. A method according to claim 25, wherein the aspheric wave-front generating part includes at least an Alvarez lens.

28. A method according to claim 27, wherein there is a one-to-one correspondence between the Alvarez lens in the aspheric wave-front generating part and a component to be independently controlled.

29. A method according to claim 28, wherein the aspheric wave-front generating part controls three components of fourth, sixth and eighth orders of the moving radius in the wave front in the aspheric wave front, and each component is approximately independently controlled by a corresponding Alvarez lens.

30. A method according to claim 29, wherein an aspheric surface amount controlled by the Alvarez lenses does not exceed 20 times wavelength of light used for the measurement.

31. An interference measurement method for measuring a surface shape of an optical element using interference, said method comprising the steps of:

dividing a measurement surface of the optical element into at least two segments; and

interference-measuring each segment,

wherein in measuring a surface shape, the measurement surface is divided into a plurality of segments according to a distance from an optical axis, and a wave front as a measurement reference for a measurement of at least one segment is an aspheric wave front, and

wherein the aspheric wave front is approximately independently controlled in fourth order or higher components in a moving radius of the wave front.

32. A method according to claim 31, wherein spherical components in the aspheric wave front are different for each divided segment, an offset amount between the aspheric wave front and a target surface in each segment does not exceed 10 times wavelength of light used for the measurement.

33. A method according to claim 31, wherein each of fourth order or higher components of a moving radius in the wave front is approximately independently controlled by the Alvarez lenses, and an aspheric surface amount of each component does not exceed 20 times wavelength of light used for the measurement.

34. An exposure apparatus using an optical element manufactured by using an interference measurement method for measuring a surface shape of an optical element using interference, said method comprising the steps of dividing a measurement surface of the optical element into at least two segments, and interference-measuring each segment, wherein in measuring a surface shape, a wave front as a measurement reference for a measurement of at least one segment is an aspheric wave front.